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ABSTRACT

Researchers have questioned whether additional resources impact student achievement--essentially, whether money matters. This policy brief examines the connections between student achievement and resource allocation with the aim of providing policymakers with guidance in this area. Key points are that targeted resource allocation especially benefits disadvantaged children, that improving the classroom environment for current teachers may be more cost-effective and yield greater gains than just raising teacher salaries, and that family variables are among the strongest indicators of student achievement. Differences in NAEP scores between states with students who have similar family characteristics suggest that resource allocation does matter and that states and policymakers may benefit from a closer examination of where their resources are being spent. Early intervention, whether in small- or large-scale programs, appears to reduce placement in special-education classes, increase graduation rates, and decrease the likelihood that students will engage in criminal activity. Policy issues and objectives include class-size reduction, offering prekindergarten programs, and exploring methods of improving teacher quality. By considering the costs and returns on this country's investment in education, policymakers can ensure that education dollars are spent most effectively and help the children who need it most. (Contains 17 references.) (RT)

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Resource Allocation: Targeting Funding for Maximum Impact

by Kirsten Miller

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Key Points

- ***Targeted resource allocation especially benefits disadvantaged children.***
- ***Improving the classroom environment for current teachers may be more cost-effective and yield greater gains than just raising teacher salaries.***
- ***Family variables are among the strongest indicators of student achievement.***

The American debate over education reform is tremendously complex. One key question is the extent to which student performance gains are linked to education resources. Over the years, some researchers have questioned whether additional education resources impact student achievement — essentially, whether money matters.

As more states undertake systemic reform, policymakers and administrators are likely to face hard choices about resource allocation. One thing, at least, is clear: Educating children costs money. But just how much money is needed, and how can policymakers and administrators maximize the use of resources to increase student achievement?

The purpose of this policy brief is to examine the connections between student achievement and resource allocation and to provide policymakers with guidance in the area of resource allocation. Although overall spending levels are an important component of this discussion, the key may not be simply to spend *more* — but rather, to spend available resources more wisely.

Does Money Matter?

Some have argued that despite increases in spending over the past 30 years, student SAT scores have been flat or, in some cases, have even declined. It is true that per-student spending, as measured by the Consumer Price Index (CPI), doubled between the late 1960s and early 1990s. But based on their findings in a multi-case study, Rothstein and Miles (1995) argue that using CPI to gauge the rise in education expenditures overstates the amount of the expenditure increase, in part because education is an extremely labor-intensive discipline, with much of the cost attributable to human capital. By Rothstein and Miles' estimate,

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real per-pupil expenditures rose 61 percent, rather than 100 percent, between 1967 and 1991. Further, Rothstein and Miles note, a significant portion of the increased spending was allocated to special education students, who do not typically participate in standardized testing. In 1991, for instance, 38 percent of new expenditures were allocated to special education for severely disabled students, while only 26 percent went toward improving regular education (Rothstein & Miles, 1995).

Moreover, although average SAT scores have been cited as an overall measure of student achievement, NAEP scores are a more accurate indicator. The NAEP has been given nationally to a representative sample of students in a range of grades since 1970, and since 1990 to representative samples of students in most states. SAT scores, on the other hand, reflect the achievement of college-bound students — and as the pool of students taking the tests has risen, overall scores have declined. And because disadvantaged children are less likely to attend college than their more advantaged peers, using the SAT as a barometer of student achievement can mask the gains of these students.

Differences in NAEP scores between states with students who have similar family characteristics suggest that resource allocation does matter – and that states and policymakers may benefit from a closer examination of where their resources are being spent.

In addition, how education resources are used varies significantly across states. Per-pupil expenditures, adjusted for cost of living, range from $4,000 in Utah and Mississippi to more than $9,000 in New Jersey and Connecticut (Grissmer, Flanagan, Kawata, & Williamson, 2000). Similarly, in the 1999–2000 school year, teachers' starting salaries ranged from $20,422 in North Dakota to $33,676 in Alaska (Nelson, Drown, & Gould, 2000). It is difficult to isolate the effects of resource levels on student achievement — and more difficult still to ascertain the cost-effectiveness of specific programs. And while at first blush it appears that some states with low per-pupil expenditures have high levels of achievement, it is important to take into account socioeconomic (SES) factors. By comparing NAEP scores for students with similar backgrounds in different states, the impact of specific allocation practices and policies becomes more clear.

Family variables, such as level of parental education and family income, remain among the strongest indicators of student achievement, accounting for 49 percent of the variance in math test scores in grades 3–5 (Darling-Hammond, 1997). For instance, students whose mothers have completed college average more than a full standard deviation in test scores over students whose mothers have not completed high school. But over the years, the family circumstances of many American children have changed. In 1995, for example, just 68 percent of American children came from two-parent homes, down from 85 percent in 1970. During the same period of time, the number of children living in poverty increased, from 14.9 percent in 1970 to 20.2 percent in 1995 (Ehrenberg, Brewer, Gamoran, & Willms, 2001).

Despite the significant impact of family variables, there are differences in NAEP scores (as much as 12 percentile points) between states with students who have similar family characteristics (Grissmer et al., 2000). And although some early literature reviews suggest that additional school expenditures do not consistently improve student outcomes (Hanushek, 1989, 1994), other studies indicate that more resources can have a significant impact on the achievement of minority and disadvantaged students (Krueger, 2000; Finn & Achilles, 1990). These differences suggest that resource allocation *does* matter for many students — and that states and policymakers may benefit from a closer examination of where their resources are being spent.

What Matters Most

Policy Issues and Objectives

Class-size reduction:
- ***Reduce pupil-teacher ratio in early grades for children who are most at risk of failure.***

Pre-kindergarten programs:
- ***Offer sustained and intensive public pre-kindergarten programs for disadvantaged children.***

Teacher characteristics:
- ***Explore a range of methods of improving teacher quality (rather than just across-the-board salary increases).***

As the body of research on resource allocation has matured, some common themes have emerged. The results of a review of the literature suggest that allocating resources in the following ways can help increase student achievement:

- Funding programs and strategies to reduce average class size in lower grades
- Developing and funding public pre-kindergarten programs
- Providing teachers with increased and flexible resources for teaching

Class Size Reduction

The most comprehensive study of class size in the United States to date has been the Student Teacher Achievement Ratio (STAR) project, which took place in Tennessee in the late 1980s. This state-sponsored study randomly assigned students entering kindergarten to one of three class sizes: small classes (13 to 17 students), standard-sized classes (22 to 26 students), or standard-sized classes that included a full-time teacher's aide in addition to the teacher.

The study found an increase in the achievement of all students in smaller classes, with larger gains for minority and disadvantaged children (Krueger, 2000; Finn & Achilles, 1999). Whereas in larger classes there was a 14.3 percent gap between the first-grade reading test scores of minority and non-minority students, the gap narrowed to just 4.1 percent in smaller classes (Finn & Achilles, 1990).

In his analysis of the STAR project, Jeremy Finn (1998) of the State University of New York at Buffalo concludes that there is "no doubt that small classes have an advantage over larger classes in student performance in the early primary grades" (p. 10). Other studies, such as the Wisconsin Student Achievement Guarantee in Education, have shown results that are similar to t[illegible] see experiment (Molnar et al., 1999).

Decreasing class size across the board is an expensive proposition. In addition, policymakers should be cognizant of the need to maintain teacher quality when decreasing class sizes. But much of the evidence suggests that smaller class sizes, especially in the early grades, can particularly benefit disadvantaged children. Therefore, policymakers should consider crafting legislation that provides this option for the children who need it most.

Pre-kindergarten Programs

In pre-kindergarten programs, as in class size reduction initiatives, there is evidence to suggest that targeted, intensive programs can provide considerable benefits to disadvantaged children. For example, Barnett (1995) found that small-scale preschool programs can have significant short-term effects on achievement and on the IQ levels of disadvantaged children. Of the programs Barnett tracked, 12 had control groups. These model programs were administered by high-quality staff, focused on small samples of students, and had low pupil-teacher ratios. Some programs began serving children at birth, while others targeted 3- to 4-year-olds. Ten of the 12 programs examined by Barnett showed significant student achievement gains at age five. Of the 11 programs that tracked participants' IQs beyond the age of five, roughly half showed continued positive effects when students entered third grade. An analysis of larger scale pre-kindergarten programs (such as HEADSTART) also indicated short-term gains, but these effects were less dramatic (Barnett, 1995).

Early intervention, whether in small- or large-scale programs, appears to reduce placement in special education classes, increase graduation rates, and decrease the likelihood that students will engage in criminal activity.

Increased student achievement is not the only benefit of pre-kindergarten programs. Early intervention, whether in small- or large-scale programs, appears to reduce placement in special education classes, increase graduation rates, and decrease the likelihood that students will engage in criminal activity (Karoly et al., 1998).

Teacher Characteristics and Resources

It has become increasingly apparent that teacher quality has a substantial impact on student achievement. But teacher quality can be difficult to measure. In addition, teacher effectiveness may be influenced by factors out of the individual teacher's control, such as the overall quality of the school's curriculum. Fundamentally, however, teacher quality can be defined as a teacher's ability to help students meet high standards (Reichardt, 2001).

Teaching is a demanding profession with a high rate of attrition. Ingersoll (1999) found that approximately six percent of all teachers leave the profession after just one year, with the majority leaving because of job dissatisfaction or because they intend to pursue different careers. This

high attrition rate has motivated many administrators and policymakers to explore ways to improve working environments and increase compensation in order to attract and retain quality teachers. Increasing teacher compensation *can* improve teacher qualifications, by attracting applicants who might not otherwise consider teaching careers. Research, however, has failed to establish a link between increased teacher salaries and higher student achievement.

Current salary schedules typically award higher salaries for years of experience and education, rather than for quality of teaching. Research does suggest that teacher quality improves after the first three years of teaching, with improvements leveling off in later years (Hanushek, Kain, & Rivkin, 1998). Nevertheless, teacher quality is difficult to measure, and as a result, can be difficult to reward.

According to Grissmer et al.'s (2000) analysis of the cost effectiveness of various policy initiatives, improving the classroom teaching environment is among the most cost-effective ways of increasing student achievement. Each of the strategies discussed in this brief can contribute to improving the classroom environment. For instance, children who attend pre-kindergarten programs may be better prepared for the classroom than those who do not, and smaller class sizes can make it easier for teachers to give students individualized attention.

In states with large proportions of disadvantaged children, lowering pupil-teacher ratios can achieve a statewide score gain of three percentile points for a statewide cost of $150 per student.

An analysis of costs associated with some of these programs reveals their relative cost effectiveness. Raising public pre-kindergarten attendance by one percentage point, for instance, costs an average of $12.00 per pupil statewide and results in score gains of 0.003–0.005 standard deviations (Grissmer et al., 2000). In addition, there is some evidence that providing teachers with additional resources (for instance, a flexible spending account for supplies) may also impact the classroom environment and increase student achievement, although more study is needed in this area. Preliminary estimates indicate that raising teacher-reported resource adequacy levels can impact student achievement for as little as $5.10 per pupil (Grissmer et al., 2000). Other possibilities for targeted resource allocation that warrant further study include offering differential pay and differential student loan forgiveness for teachers in geographic and content shortage areas.

This is not to suggest that offering additional salary incentives to teachers is not important. Increasing teacher salaries is, by any measure, a laudable goal. Nevertheless, policymakers and educators should consider a range of ways of providing the current teacher workforce with the tools they need to raise student achievement, rather than concentrating all of their resources on raising salaries.

Investing in Education: Considering the Options

The cost-effectiveness of the strategies outlined in this brief is, in large part, dependent on the circumstances of each state's students. For example, in states with large proportions of disadvantaged children, lowering pupil-teacher ratios can achieve a statewide score gain of .010 — or approximately three percentile points — for a statewide cost of $150 per student. In a middle-SES state, achieving the same score gain would require an expenditure of $450 per student. Notably, however, increasing teacher resources at a statewide per-pupil cost of $110 results in the same performance gains across state SES levels (Grissmer et al., 2000) (see table).

Table 1. Estimate of Additional Per-Pupil Expenditures to Achieve .010 Gain in Achievement for States with Different SES ($)

	State SES		
Type of expenditure	Low	Medium	High
Pupil-teacher (1–4)	150	450	>1,000
Pre-kindergarten	120	320	>1,000
Teacher resources — low	110	110	110
Teacher resources — medium	140	140	140

Source: Improving Student Achievement, What State NAEP Test Scores Tell Us, by D. Grissmer, A. Flanagan, J. Kawata, & S. Williamson, 2000, Santa Monica, CA: RAND. Reprinted by permission of RAND.

Outputs, such as test scores, are important indicators of student achievement, but they are not the only indicators of a quality education.

Outputs, such as test scores, are important indicators of student achievement, but they are not the only indicators of a quality education. Educators and policymakers alike will benefit from further research on this topic and from new ways of thinking about resource allocation. Faced with pinched budgets and increasing numbers of children with special needs, policymakers need to be cognizant of the cost-effectiveness of different programs. Education is an investment in our nation's children. By considering the costs and the returns on that investment, policymakers can ensure that education dollars are spent most effectively and help the children who need it most.

Kirsten Miller is a writer and editor at McREL.

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